 ALPHA UNIVERSITY BORAMA

FACULTY OF HEALTH SCIECEN

**DEPARTMENT OF PUBLIC HEALTHS AND PHARMACTY**

**COURSE: COMMMUNICABLE DISEASE**

**ASSIGMENT**

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**TITLE:** **Arthropod borne infection**

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**1. Introduction to Arthropod-Borne Infections**

Arthropod-borne infections, also known as vector-borne diseases, are illnesses transmitted to humans and other animals by arthropods, primarily insects and arachnids. These arthropods act as vectors, carrying pathogenic microorganisms such as viruses, bacteria, protozoa, and helminths from an infected host (human or animal reservoir) to a susceptible host. Common arthropod vectors include mosquitoes, ticks, fleas, lice, sandflies, and mites. These infections represent a significant global public health burden, particularly in tropical and subtropical regions where environmental conditions favor vector proliferation and pathogen transmission. Factors such as climate change, urbanization, deforestation, and increased global travel and trade contribute to the changing epidemiology and geographical expansion of many arthropod-borne diseases, posing ongoing challenges to public health systems worldwide. Understanding the complex interplay between the pathogen, vector, host, and environment is crucial for effective prevention and control.

**2. Types of Arthropod-Borne Infections**

Arthropod-borne infections can be broadly categorized based on the type of pathogenic microorganism they transmit:

**Viral Infections (Arboviruses):** This is a large and diverse group of viruses transmitted by arthropods. Examples include Dengue fever, Zika virus, Chikungunya, Yellow fever, West Nile virus, Japanese encephalitis (all primarily mosquito-borne), and Tick-borne encephalitis.

**Bacterial Infections:** Several significant bacterial diseases are transmitted by arthropods. Examples include Lyme disease (tick-borne, caused by *Borrelia burgdorferi*), Plague (flea-borne, caused by *Yersinia pestis*), Rickettsial infections like Rocky Mountain Spotted Fever and Typhus (tick, flea, or louse-borne), and Tularemia (tick or deer fly-borne).

**Protozoal Infections**: These are infections caused by single-celled eukaryotic organisms. The most prominent example is Malaria (mosquito-borne, caused by *Plasmodium* parasites). Others include Leishmaniasis (sandfly-borne, caused by *Leishmania* parasites) and Trypanosomiasis (e.g., African Trypanosomiasis or sleeping sickness, transmitted by tsetse flies, and American Trypanosomiasis or Chagas disease, transmitted by triatomine bugs).

**Helminthic Infections:** Some parasitic worms (helminths) are also transmitted by arthropods. Examples include Lymphatic Filariasis (elephantiasis), transmitted by mosquitoes, and Onchocerciasis (river blindness), transmitted by blackflies.

**3. Signs and Symptoms of Arthropod-Borne Infections**

The signs and symptoms of arthropod-borne infections are highly variable depending on the specific pathogen involved, the host's immune response, and the severity of the infection. However, many share some common initial, non-specific symptoms, which can make early diagnosis challenging. These may include:

* Fever (often sudden onset and high)
* Headache
* Muscle and joint pain (myalgia and arthralgia)
* Fatigue and malaise
* Rash (can vary in appearance, e.g., maculopapular, petechial)
* Nausea, vomiting, and diarrhea
* More specific or severe symptoms can develop depending on the disease. For instance:

**Dengue:** Severe headache, pain behind the eyes, severe joint and muscle pain ("breakbone fever"), and in severe cases (Dengue Hemorrhagic Fever/Dengue Shock Syndrome), bleeding, plasma leakage, and organ impairment.

**Malaria:** Cyclical fever, chills, sweats, headache, and potentially severe complications like cerebral malaria, severe anemia, and respiratory distress.

**Lyme Disease:** Characteristic "bull's-eye" rash (erythema migrans) at the site of the tick bite, fever, fatigue, and if untreated, can progress to involve joints, heart, and nervous system.

**Zika Virus:** Often mild, but can cause microcephaly and other congenital abnormalities in infants born to infected mothers, and Guillain-Barré syndrome in adults.

**Yellow Fever**: Jaundice (yellowing of skin and eyes), hemorrhage, and organ failure in severe cases.

**4. Common Arthropod-Borne Infections**

While numerous arthropod-borne infections exist, some are particularly widespread and have a significant global impact:

**Malaria:** Transmitted by Anopheles mosquitoes; caused by *Plasmodium* parasites. Remains a leading cause of death, especially among children in sub-Saharan Africa.

**Dengue Fever:** Transmitted by Aedes mosquitoes (*Aedes aegypti* and *Aedes albopictus*); caused by dengue virus. Rapidly expanding globally, with risk of severe complications.

**Lyme Disease:** Transmitted by Ixodes ticks; caused by *Borrelia burgdorferi*. Common in North America and Europe.

**Chikungunya:** Transmitted by Aedes mosquitoes; caused by Chikungunya virus. Characterized by severe, often debilitating joint pain.

**Zika Virus Disease**: Transmitted by Aedes mosquitoes; caused by Zika virus. Gained prominence due to its association with congenital birth defects.

**Yellow Fever**: Transmitted by Aedes and Haemagogus mosquitoes; caused by Yellow fever virus. Endemic in parts of Africa and South America, with risk of outbreaks.

**West Nile Virus Infection:** Transmitted by Culex mosquitoes; caused by West Nile virus. Can cause neurological disease in a minority of infected individuals.

**Leishmaniasis:** Transmitted by phlebotomine sandflies; caused by *Leishmania* parasites. Manifests in cutaneous, mucocutaneous, or visceral forms.

**5. Prevention and Control Measures for Arthropod-Borne Infections**

Prevention and control strategies target the vector, the pathogen, and human exposure:

**Vector Control:**

**Environmental Management:** Eliminating or modifying vector breeding sites (e.g., draining stagnant water for mosquitoes, clearing vegetation for ticks).

**Chemical Control:** Use of insecticides (e.g., indoor residual spraying, larviciding, space spraying), ensuring responsible use to avoid resistance and environmental harm.

**Biological Control:** Introduction of natural predators or pathogens of vectors (e.g., larvivorous fish, *Bacillus thuringiensis israelensis*).

Genetic Control: Emerging technologies like releasing sterile male insects.

**Personal Protection:**

* Using insect repellents containing DEET, picaridin, or oil of lemon eucalyptus.
* Wearing protective clothing (long sleeves, long pants, socks) especially during peak vector activity times.
* Using insecticide-treated bed nets (ITNs), particularly for malaria prevention.
* Screening windows and doors.

**Vaccination:** Effective vaccines are available for some arthropod-borne diseases, such as Yellow fever, Japanese encephalitis, and Tick-borne encephalitis. Research is ongoing for others like Dengue and Malaria.

**Surveillance and Early Detection:** Robust surveillance systems for both vectors and human cases are essential for early warning and rapid response to outbreaks.

**Health Education and Community Engagement:** Raising awareness about transmission, symptoms, and preventive measures to empower individuals and communities to take protective actions.

**Blood Safety:** Screening blood donations for certain arthropod-borne pathogens (e.g., West Nile virus, Zika virus).

**6. Diagnosis of Arthropod-Borne Infections**

Diagnosis involves a combination of clinical assessment, epidemiological information (e.g., travel history, exposure to vectors), and laboratory tests:

**Microscopy:** Used for direct visualization of parasites, such as *Plasmodium* in blood smears for malaria, or *Leishmania* in tissue biopsies.

**Serological Tests:** Detect antibodies (IgM, IgG) produced by the host in response to infection, or viral/bacterial antigens. Examples include ELISA, immunofluorescence assays (IFA). Useful for dengue, Zika, West Nile virus, Lyme disease, and rickettsial infections.

**Molecular Tests:** Detect the genetic material (DNA or RNA) of the pathogen. Polymerase Chain Reaction (PCR) and its variants are highly sensitive and specific. Widely used for viruses (e.g., Zika, dengue, chikungunya), bacteria (e.g., *Borrelia*), and protozoa.

**Culture:** Isolation and growth of the pathogen from clinical specimens (blood, cerebrospinal fluid, tissue). Can be used for some bacteria and viruses, but often time-consuming.

**Rapid Diagnostic Tests (RDTs)**: Provide quick results, often at the point of care. Widely used for malaria (detecting parasite antigens) and increasingly for other infections like dengue.

**7. Treatment of Arthropod-Borne Infections**

**Treatment strategies depend on the causative agent**:

**Viral Infections:** For most arboviral infections (e.g., Dengue, Zika, Chikungunya, West Nile virus), there is no specific antiviral treatment. Management is primarily supportive, focusing on relieving symptoms (e.g., rest, hydration, analgesics like paracetamol – avoiding aspirin and NSAIDs in dengue due to bleeding risk), and managing complications. For Yellow fever and some forms of encephalitis, supportive care in intensive care units may be necessary.

**Bacterial Infections**: Bacterial infections like Lyme disease, plague, rickettsial diseases, and tularemia are generally treatable with appropriate antibiotics (e.g., doxycycline, amoxicillin, ceftriaxone, ciprofloxacin, streptomycin, depending on the specific bacterium and patient factors). Early diagnosis and treatment are crucial to prevent severe complications.

**Protozoal Infections:**

**Malaria:** Treated with antimalarial drugs (e.g., artemisinin-based combination therapies (ACTs), chloroquine, mefloquine, quinine), with drug choice depending on the *Plasmodium* species, drug resistance patterns, and severity of illness.

**Leishmaniasis**: Treatment depends on the species and clinical form, using drugs like pentavalent antimonials, amphotericin B, miltefosine, or paromomycin.

**Trypanosomiasis**: Specific drugs are available, but treatment can be complex and have side effects, especially for late-stage disease.

**Helminthic Infections:** Antiparasitic drugs are used, such as diethylcarbamazine (DEC) or ivermectin for lymphatic filariasis, and ivermectin for onchocerciasis.

Supportive care, including fluid management, pain relief, and monitoring for complications, is a critical component of treatment for many arthropod-borne infections, regardless of the specific pathogen.